

REMARKS

The Office Action issued November 06, 2001 has been reviewed and the comments of the U.S. Patent and Trademark Office have been considered. Claim 20 has been canceled. Claims 1, 3, 21 and 22 have been amended. Claims 10-19 have been indicated as being allowable. Accordingly, Applicants request reconsideration of the pending claims 1-5, 21, 22 and 23.

Initially, Applicants' representative wishes to express sincere appreciation for the time and effort committed by the Examiner in conducting the personal interview on April 24, 2002. In the interview, Applicant's representative discussed proposed amendments to claims 1, 3 and 20 to overcome the prior art rejections. The Examiner agreed to consider the proposed amendment in a formal response to the Office Action.

Claims 1-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wieczorek in view of Daly and Munezane. Claims 20-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wieczorek in view of Daly.

Insofar as the rejections can be applied to amended claims 1, 3 and 21, Applicants respectfully traverse these rejections because neither Wieczorek, Daly nor Munezane, singularly or in combination, teaches or suggests every feature of amended claims 1, 3 or 21.

Initially, it is respectfully noted that Munzenane does not qualify as prior art to amended claims 1 and 3 because these claims are now entitled to the benefits of the prior application S.N. 08/795,672 (now U.S. Patent No. 5,875,972). Specifically, claims 1 and 3 have been amended to recite a direct injection fuel injector with, *inter alia*, a seat disposed at the outlet portion of a body, and that the swirl generator has a guide member contiguous to at least one flat disk. Support for this amendment to claims 1 and 3 is provided in the originally filed specification, for example, at page 5.

Notwithstanding the disqualification of Munzenane as prior art, neither of Wieczorek, Daly nor Munezane, singularly or in combination, teaches or suggests a guide member contiguous to at least one flat disk. In particular, each of the cited references merely disclosed either a needle guide (reference number 26 in Wieczorek), a needle guide/swirler (reference number 18 in Daly) or a swirler (reference number 13 in Munezane). Applicants respectfully assert that one of ordinary skill in the art would not modify either Wieczorek, Daly or Munezane to incorporate a flat disk, without the benefits of Applicants' disclosure, as such modification

would alter the arrangement of parts between the seat to the needle of either Wieczorek, Daly or Munezane, and could render them unsuitable for their intended purpose. Therefore, claims 1 and 3 are patentable over Wieczorek, Daly or Munezane, singularly or in combination thereof.

Claim 21 has been amended to recite a method of stabilizing temperature of a direct injection fuel injector that is achieved, in part, by providing a neck portion with a metallic cylindrical annulus, the metallic cylindrical annulus having an outer surface with a first section and a second section of a substantially constant outer diameter with an annular member between these sections; and selecting the metallic cylindrical annulus that surrounds and forms a body passage having an average cross-sectional area of less than 2.25 times the cross-sectional area of the needle. Support for this amendment is provided in the originally filed specification, at, for example, page 5, lines 7-18 and Figure 1. In particular, Figure 1 shows an annular member in the form of a seal disposed on the outer surface of the metallic cylindrical annulus.

In contrast, neither Wieczorek nor Daly, singularly or in combination, teaches or suggests a method of stabilizing temperature of a direct injection fuel injector with the features recited in claim 21. In particular, Figure 1 of Wieczorek indicates that a body of the fuel injector is plastic by a sectional legend, readily understood by one skilled in the art, as resin or plastic (*See*, MPEP 608.02, page 600-95, 8th Ed., Aug. 2001). Likewise, Daly uses the same legend to indicate that a plastic—instead of a metallic cylindrical annulus as recited in the method of claim 21. Furthermore, sections of plastic body of the fuel injector 10 (of either Wieczorek or Daly) on opposite sides of the annular member, which is an o-ring seal, are not of a substantially constant outer diameter, as recited in the method of claim 21.

Notwithstanding the deficiencies of either Wieczorek or Daly as discussed above, the Office Action asserts that it would have been a matter of routine optimization for one of ordinary skill in the art to have arrived at the claimed relationship between body passage and the needle. However, one of ordinary skill in the art would not modify either Wieczorek or Daly as a matter of routine optimization because Wieczorek or Daly, singularly or in combination, is unconcerned with the problem of temperature stabilization in a direct fuel injection application. This is evidenced by the plastic body and elastomeric seal, as discussed above in the fuel injector of either Wieczorek or Daly, which are believed to be inapplicable for direct injection application. Applicants, in contradistinction, have discovered a specific relationship of the recited features that allows temperature stabilization of a high pressure, direct injection fuel injector, as recited in

claim 21. The only motivation to modify either Wieczorek or Daly so as to reach the claimed invention as a whole is supplied by Applicants' own disclosure, which has been improperly relied upon. Accordingly, claim 21 is patentable over Wieczorek or Daly, singularly or in combination (Munzenane having been withdrawn as applicable against claims 20-23 in this Office Action).

Claims 2-5 and 22-23 depend ultimately from respective independent claims 1, 3 and 21, are therefore also allowable for at least the same reason as claims 1, 3 and 21, as well for reciting additional features.

CONCLUSION

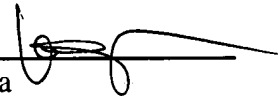
In view of the foregoing amendments and remarks, Applicant respectfully requests the reconsideration and reexamination of this application and allowance of the pending claims 1-5, 10-19 and 21-23. Applicant respectfully invites the Examiner to contact the undersigned at (202) 739-5203 if there are any outstanding issues that can be resolved via a telephone conference.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

EXCEPT for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. §1.136(a)(3).

Respectfully submitted,

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VERSION WITH MARKINGS SHOWING CHANGES MADE

IN THE SPECIFICATION:

The paragraph on page 1, starting on line 1 has amended as follows:

--Cross-Reference to Related Applications

This application is a continuation-in-part of U.S. application Serial No. 09/259,168, filed 29 June 1999 **now U.S. Patent No. 6,039,272**; which is a continued prosecution application (CPA) of U.S. application Serial No. 09/259,168, filed 26 February 1999, now abandoned; which is a continuation application of U.S. application Serial No. 08/795,672, now U.S. Patent No. 5, 875,972; which is a CPA of U.S. Serial No. 08/795,672, filed 6 February 1997, now ~~{U.S. Patent No. 5,875,972}~~ **abandoned**. This application claims the right of priority to each of the prior applications. Furthermore, each of the prior applications is hereby in their entirety incorporated by reference.--

IN THE CLAIMS:

Claim 20 has been canceled.

Claims 1, 3, 21 and 22 have been amended as follows:

1. (Thrice Amended) A direct injection fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector comprising:

a body having an inlet portion, an outlet portion, a neck portion disposed between the inlet portion and the outlet portion, the neck portion including a cylindrical annulus that provides a body passage extending from the inlet portion to the outlet portion along the longitudinal axis of the fuel injector;

an armature proximate the inlet portion of the body;

a cylindrical needle operatively connected to the armature;

a seat ~~{protruding from}~~ **disposed at** the outlet portion of the body; and

a swirl generator proximate the seat, the swirl generator having a guide member contiguous to a flat disk;⁸⁷

wherein the cylindrical annulus of the body includes an inner diameter that is greater than a diameter of the cylindrical needle so as to define the body passage, which maintains an operative relationship between the body and the needle when the body is exposed to operating temperatures of a cylinder of an engine.

3. (Thrice Amended) A direct injection fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector comprising:

a body having an inlet portion, an outlet portion, a neck portion disposed between the inlet portion and the outlet portion, the neck portion including a cylindrical annulus that provides a body passage extending from the inlet portion to the outlet portion along the longitudinal axis of the fuel injector;

an armature proximate the inlet portion of the body;

a cylindrical needle operatively connected to the armature;

a seat ~~[protruding from]~~ disposed at the outlet portion of the body; and

a swirl generator proximate the seat, the swirl generator having a guide member contiguous to at least one flat disk;

wherein the cylindrical annulus of the body includes an inner diameter that is greater than a diameter of the cylindrical needle so as to define the body passage, which maintains an operative relationship between the body and the needle when the body is exposed to operating temperatures of a cylinder of an engine, and wherein the seat includes a first surface exposed to the fuel passageway and a second surface exposed to an exterior of the fuel injector, the first surface being spaced from the second surface a defined distance along the longitudinal axis, the first surface having at least one cut-out configuration that extends for a fraction of the defined distance into an interior of seat.

21. (Amended) ~~The A~~ method of claim 20, wherein the of stabilizing temperature of a direct injection fuel injector, the direct injection fuel injector having a body and a neck portion; an armature proximate an inlet of the body; a needle operatively connected to the

armature; a seat disposed at the outlet of the body; and a swirl generator proximate the seat, the method comprising:

providing the needle with a substantially uniform cross-sectional area and the neck portion with a metallic cylindrical annulus, the metallic cylindrical annulus having an outer surface with a first section and a second section of a substantially constant outer diameter with an annular member disposed between the first and second sections; and

selecting the metallic cylindrical annulus to surround the needle and to form a body passage having an average cross-sectional area of the body passage is less than 2.25 times the substantially uniform cross-sectional area of the needle, the body passage maintaining an operative relationship between the body and the needle so that fuel in the body passage transfers heat from the body to the needle to maintain a minimum temperature gradient and to maintain an operative relationship between the body and the needle when the body is exposed to operating temperatures of an engine cylinder.

22.(Amended) The method of claim 20 21, wherein the step of providing further comprises providing a substantially cylindrical member as the needle, and a cylindrical annulus as a neck of the body, the cylindrical annulus having an inner diameter that is no more than 50% greater than substantially uniform diameter of the substantially cylindrical member, and an outer diameter that is no less than 100% greater than the inner diameter.
